3-4

Volume III JANUARY 1942 Number 1.

Medical Library
FEB 24 1942

DISEASES OF THE NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

PUBLISHED MONTHLY for the PHYSICIAN in the GENERAL PRACTICE of MEDICINE

CONTENTS:

THE RADICAL TREATMENT OF THE PSYCHOSES AND NEUROSES. ALTERATIONS IN PERSONALITY FOLLOWING PREFRONTAL LOBOTOMY (Page 6)
Walter Freeman, M.D., Ph.D., *and* James W. Watts, M.D., Washington, D. C.

A STATISTICAL SURVEY OF THE BIOGENESIS OF INVOLUTIONAL MELANCHOLIA (Page 16)
E. V. Eyman, M.D., F. M. Forster, M.D., T. D. Rivers, M.D., T. H. Wright, M.D., *and* H. P. Rome, M.D., Philadelphia, Pennsylvania

CLINICAL CHRONAXIE (Page 20)
Joseph Moldaver, M.D., New York, New York

PSYCHONEUROCARDIOVASCULAR DISORDERS. Peripheral Vascular Neuroses (Page 24)
George Herrmann, M.D., Galveston, Texas

EDITORIAL, SANATORIA, BOOK REVIEW

ASSOCIATE EDITORS

Peter Bassoe, M.D. — Chicago, Illinois	Jacob Kasanin, M.D. — San Francisco, California
A. E. Bennett, M.D. — Omaha, Nebraska	H. Beckett Lang, M.D. — Albany, N. Y.
Franklin G. Ebaugh, M.D. — Denver, Colorado	Frank H. Luton, M.D. — Nashville, Tennessee
O. Spurgeon English, M.D. — Philadelphia, Penn.	Wm. Malamud, M.D. — Worcester, Massachusetts
Temple Fay, M.D. — Philadelphia, Penn.	Donald McEachern, M.D. — Montreal, Canada
Hamilton Ford, M.D. — Galveston, Texas	Karl A. Menninger, M.D. — Topeka, Kansas
Walter Freeman, M.D. — Washington, D. C.	Adolf Meyer, M.D. — Baltimore, Maryland
Jas. K. Hall, M.D. — Richmond, Virginia	Glenn Myers, M.D. — Los Angeles, California
George T. Harding, M.D. — Columbus, Ohio	Hans H. Reese, M.D. — Madison, Wisconsin
A. Hauser, M.D. — Houston, Texas	Paul L. Schroeder, M.D. — Chicago, Illinois
Eugen Kahn, M.D. — New Haven, Connecticut	Theodore A. Watters, M.D. — New Orleans, La.
Louis J. Karnosh, M.D. — Cleveland, Ohio	Wm. Walter Young, M.D. — Atlanta, Georgia

Titus H. Harris, M.D.
Galveston, Texas
EDITOR-IN-CHIEF

YEARLY SUBSCRIPTION $2.50
SINGLE COPIES 25 Cents

Murray Kornfeld
Chicago, Illinois
MANAGING EDITOR

WOODCROFT HOSPITAL

Pueblo, Colorado

Telephone 84

● *An institution for the diagnosis, care and treatment of those nervous and mentally ill and addictions.*

CRUM EPLER, Superintendent

COMPTON SANITARIUM

AND

LAS CAMPANAS HOSPITAL

COMPTON, CALIFORNIA

(Near Los Angeles)

Compton Sanitarium is a private psychiatric hospital with 120 beds. Emphasis is given psychotherapy by a staff of resident psychiatrists. Other treatment procedures are duly evaluated and administered. Careful records are maintained. There are psychiatrically trained graduate nurses; student nurses through affiliation; nursing attendants; dietitian; occupational therapist; recreational therapist; hydrotherapist; masseuse. Las Campanas Hospital (30 beds) provides adjunct general hospital facilities. Compton Sanitarium and Las Campanas Hospital are approved by the American College of Surgeons.

GLENN MYERS, M.D.
Medical Director.

Beverly Hills Sanitarium

for

The Study and Treatment of Nervous and Mental Diseases

218 No. Westmoreland DALLAS, TEXAS Telephone 9-3114

This sanitarium is a psychopathic hospital with a home-like environment and is equipped to treat psychiatric and neurological cases in a most scientific manner by means of phychotherapy, occupational therapy, recreational therapy and physiotherapy, including hyperpyrexia, insulin and metrazol treatments in special conditions.

ARTHUR J. SCHWENKENBERG, M.D.
Attending Neuropsychiatrist

ROBERT E. WINN, M.D.
Resident Physician

VOL. III JANUARY 1942 NO. 1

EDITORIAL OFFICES
UNIVERSITY OF TEXAS SCHOOL OF MEDICINE
800 AVENUE B., GALVESTON, TEXAS

BUSINESS OFFICES
PHYSICIANS POSTGRADUATE PRESS
500 NORTH DEARBORN ST., CHICAGO, ILLINOIS

COPYRIGHT, 1942 BY
PHYSICIANS POSTGRADUATE PRESS

DISEASES of the NERVOUS SYSTEM

(PUBLISHED MONTHLY)

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

EDITORIAL COMMENT

Prefrontal Lobotomy as a Therapeutic Aid

In keeping with the efforts to report upon accepted techniques in the treatment of diseases of the nervous system, this issue of the Journal contains an article by Drs. Walter Freeman and James W. Watts on the value of prefrontal lobotomy in selected psychiatric disorders.

In 1934, Jacobsen noted that removal of both frontal areas of chimpanzees with experimental neuroses caused the animals to become contented, and while maintaining interest in their environment, they no longer developed emotional reactions or neuroses in response to failure. Moniz of Portugal, in 1936, first applied these findings to man, removing multiple areas from the prefrontal white matter with a "leucotome." Freeman and Watts in the same year reported the first results in this country at the meeting of the Southern Medical Association. Since then, Lyerly, Tarumianz, Strecker, Grant, Palmer and others have contributed to the subject. The operation has been modified by all these workers to some extent but the principle remains the same—to interrupt fibres in the white matter of the frontal lobes—(anterior to motor pathways).

Prefrontal lobotomy has produced its most spectacular results in the obsessive compulsive states and chronic depressions—less complete results in schizophrenia. Its greatest appeal lies in the relief obtained in chronic hopeless psychoses, particularly chronic depressions (involutional type usually). In the past, psychoses of this type lasting for 15 years were considered permanent, yet many excellent results have followed lobotomies. The procedure here is on perfectly solid ground. If it is used on earlier cases, however, the results may be difficult to evaluate because of the possibility of spontaneous recovery or recovery by the use of less heroic methods. Only through careful psychiatric study before and after operation will data be accumulated which will give the procedure its just position along with other forms of therapy.

The side effects are usually a mild euphoria, easy adjustment to the environment and some loss of ability to plan and organize (reaction of the individual with respect to the future). Since surgical section of brain fibres produces permanent loss of these fibres, the conservative physician will not use the procedure except in cases of long standing (3-5 years at least) and only in those cases who have had a fair trial with other forms of treatment, such as shock therapy.

Freeman and Watts, with whom I had the honor of spending a few days this summer, have done more work than any other group in this field. While they have not tried to be conservative in choice of cases, I believe they have been so in evaluating their results. Much useful information is being accumulated, but the great need at the present time is the study of a larger series of cases with strict psychiatric control.

It is probable that there will be further modification of the procedure and other areas of the brain may be attacked in the future, but this operation, while drastic, certainly gives a renewed hope to the management of certain chronic psychiatric patients.

James Greenwood, Jr., M.D.

The Radical Treatment of the Psychoses and Neuroses*

Alterations in Personality Following Prefrontal Lobotomy

WALTER FREEMAN, M.D., Ph.D., F.A.C.P., *and*
JAMES W. WATTS, M.D., F.A.C.S.
Washington, D. C.

Dr. Freeman, after graduating from the University of Pennsylvania in 1920, took postgraduate work there and abroad. He was the Director of Laboratories for St. Elizabeth's Hospital from 1924 to 1933, and has held the position of Professor of Neurology at George Washington University since 1926. He is the author of "Neuropathology" and has contributed about 100 scientific articles to the periodical literature. He is Secretary of the American Board of Psychiatry and Neurology.

Dr. Watts was graduated from the University of Virginia in 1928. From 1928 to 1935 he trained for neurosurgery in this country and abroad, and since 1935 has been Associate Clinical Professor of Neurosurgery at George Washington University.

In speaking of the radical treatment of the psychoses, we wish to use the word radical in its original meaning, namely, having to do with the root of the disorder. Most of the psychoses have their sources in the fundamental personality of the sufferer, and therefore the radical treatment reaches down to those roots and by altering the personality brings about a different kind of adaptation to the circumstances of his existence.

Prefrontal lobotomy is radical treatment, not only in the strict sense, but also in its derivative meaning. It should be employed only after due consideration of all the factors involved and only when the likelihood of recovery either spontaneously or under other treatment is remote. Nevertheless, we believe it is the treatment of choice in certain instances, none too numerous, where the personality characteristics of the individual have proved that his reactions to life experiences are too aberrant to permit of his harmonious reintegration into society within a reasonable time.

In order better to understand what the operation accomplishes, it is necessary first to study the functioning of the brain deprived of certain parts of the prefrontal areas, and then to erect certain hypotheses concerning the parts inactivated. Finally, the effort will be made to demonstrate certain conditions under which the intact frontal lobes may work to the detriment of the individual as a whole under the special circumstances of a psychosis.

Prefrontal lobotomy consists in the exposure of the prefrontal areas through burr holes placed in the coronal suture. By means of a blunt knife the prefrontal white matter is transected in the plane of the coronal suture. This incision interrupts more or less completely the thalamo-frontal pathways without damaging to any great degree the intercortical connections.[1]

The composite picture of a patient some months after prefrontal lobotomy has been gained from a study of about one hundred cases operated upon during the past five years. While there are considerable differences between individuals—and these will be discussed later—the most striking thing about them is their lack of self-consciousness. Most of them show no reluctance at being interviewed in the presence of strangers, and can even be led to discuss such intimate matters as their reactions to members of the family, their bathroom habits, and their sexual adjustment. They do not shrink, as do the patients who have recovered spontaneously, from discussion of the circumstances leading up to their illness, the episodes of the illness itself, or their experiences in the hospitals. This lack of self-consciousness extends to their activities in every-day life, and almost numberless examples of free and easy self-expression have been reported to us. As an instance, one of us happened to watch one of our patients while she was attempting to board a bus. Apparently she had not noticed that the sign at the curb read "Car Stop," and when the bus was held up by a red light she tapped energetically on the door, calling and gesticulating to the obvious amusement of the

* Department of Neurology, George Washington University.

passengers inside. The effect was heightened by the efforts of her husband, a small mild-mannered individual, who was trying to escort her to the bus stop.

The ease and freedom in social relationships was expressed in concrete terms by another of our patients who reported:

"I can go to the theater now and really enjoy the show without thinking how my back hair looks or whether my shoes pinch."

And by another patient: "It doesn't matter what it is, or where it is, or who it is, if I've got something to say I bring it out, and that's that."

Just as there is a lack of preoccupation with the self as a member of society, so it is with the functioning of the viscera, another form of consciousness of the self. Indigestion is rare following prefrontal lobotomy. As a consequence, most of the patients gain a good deal of weight. The prize was taken by a slip of a girl weighing 85 lbs. before operation, who was up to 210 when last seen. It is only fair to state, however, that she weighed 180 before her illness. Such embonpoint does not concern the patients. They merely state that their clothes are getting tight. One of the few instances of indigestion occurred after the patient had raided the icebox during the evening and consumed a cantaloupe and two bananas.

At times, the lack of self-consciousness has been troublesome. This has been manifested quite frequently in a certain tactlessness and rather bold monopolizing of the conversation, amounting to rudeness and to blunt statement of opinion that would have better been withheld. Yet seldom have we observed facetiousness to the point of *Witzelsucht*. Reports indicate that certain patients behave in exemplary fashion while with strangers, but indulge in great freedom of expression or even in baby talk while in the home. One lady, a graduate nurse, knew all the dogs and cats in town, and took delight in picking them up and fussing over them, somewhat to the discomfort of her relatives. As a rule, there is a certain childishness in this freedom of expression that is condoned by the close associates: "She didn't mean it. It was only her way of expressing herself."

Psychologically, this change from preoccupation with the self shows up strikingly in the contrast between the preoperative and postoperative Rorschach and Bernreuter tests as administered to our patients by Dr. Thelma Hunt.

Probably linked with this lack of self-consciousness is a considerable tendency toward response to outside events. This lies at the base of the distractibility that has been so often described in cases of frontal lobe disorders. And yet many of these patients are capable of prolonged absorption in intellectual pursuits. It is the contrast of the preoperative and postoperative condition that furnishes the most striking picture. One young woman who was naturally of a shy and retiring disposition, and who had been in a catatonic state for five months before operation, later took a course in interior decorating, attended dances, went to the movies frequently and for the past two years has been employed regularly as a stenographer. She responds in a more lively fashion to her fellow-workers than ever before.

Emotion

The emotional responses of these patients are usually rather lively. In practically all instances the emotional tone is somewhat elevated, and frequently the patients radiate a sense of cheerfulness. They are easily moved to laughter and to anger, but seldom to tears. The responses are vivid, but they are lacking in depth and they soon disappear without leaving the patient shaken. This was strikingly demonstrated in the case of one of our patients, a tactless, nagging, outspoken individual who caused his wife much embarrassment by his free comment upon her relatives and friends. When she rejected his amorous advances on one occasion, he throttled her and beat her cruelly. She escaped by stratagem to her parents' home nearby, and a few minutes later her father and brother came in and found the patient sitting in the room, quietly surveying the disorder. He had already formulated his plan to leave home and stop bothering his wife, to quit his job and travel about the country. He realized perfectly well, once the act had been committed, what the consequences would be, but the surge of emotion that had caused the outbreak subsided almost instantly, with no repercussions upon him. He was truly regretful, but not harassed by remorse. Another patient, a year after operation, was severely beaten by her husband

during a quarrel provoked by her nagging and his intoxication. She was unable to stay angry with him, however, and graciously received his apologies while her face was still swollen and discolored.

Patients seem to lose the power of foreseeing the effects of their activities. This has been stressed in a previous paper,[2] but the classic instance may well be repeated here. The patient, an aggressive business man, harassed by doubts and fears, with obsessive preoccupation with suicide, developed objectionable behavior following operation. He picked the paint off the chair and the bed, pulled the electrical fixtures from the walls and tore the bedclothing and the screens at the windows. He also slapped the nurses on the buttocks when they turned from him. One day he rang the fire alarm and brought the nurses and orderlies running. When taxed with this disturbing behavior, he replied: "Now that I've done it, I see it was not the thing to do, but beforehand I couldn't tell whether it would be all right or not."

Inertia, indolence and laziness are frequently observed after operation, sometimes for a short time, sometimes permanently. Much seems to depend upon the previous energy responses of the patients, although the effect is to some degree dependent upon the amount of frontal lobe tissue separated at operation. Indeed, there appears to be a certain quantitative relationship between the volume of brain inactivated and the severity of all the changes. Some of this indolence appears to derive from the feeling of contentment bordering on euphoria that is manifested by these patients, but also to be considered is the cutting down on the necessity for accomplishment, that inner drive for perfection that is so prominent a feature in the history of most of the patients operated upon. Fatigability is a common phenomenon. Yet the reverse has also been observed in many instances, namely a tirelessness that was first emphasized by Ackerly.[3] Inertia is by definition a biphasic phenomenon, in that an action once initiated is carried out until some other force is brought to bear. Perhaps the lack of fatigue is part and parcel of the general indifference to stimuli coming from within. Even those that show considerable energy and indefatigability, however, are more than likely apt to procrastinate. As one formerly very industrious lady said: "I wake up in the morning and I think of all the things I have to do, but I say to myself: 'I'll do that tomorrow' and then, somehow, tomorrow never comes." Many of them complain of the inertia, sometimes in humorous fashion, but without real feeling in the matter. The urge for perfection is reduced, the striving for accomplishment is tempered, and the individual is content with things as they are.

Aggressive tendencies are sometimes released from control. Before operation is considered there should be a careful evaluation of aggressive tendencies, as manifested during early life. We have had one very disconcerting experience with an individual whose depression probably resulted from the constant obligation to restrain his aggressive tendencies. His history is given in considerable detail in a monograph now in press,[4] but in short his business is ruined, his friends and family alienated, he has a number of lawsuits on his hands, some for physical violence, and yet he goes about munching candy and declaring he never felt better in his life.

Intelligence

Much has been written about the disturbances in intellectual function resulting from inactivation of parts of the frontal lobes. We would like to pay particular tribute to Hebb,[5] to J. McV. Hunt[6] and to Molly Harrower-Erickson[7] who have contributed so much to our knowledge in this field. Formal intelligence tests reveal little or no defect in patients submitted to prefrontal lobotomy. For a few weeks after operation their replies are slowed, but even within as short a period as two weeks, the test scores are usually better, probably because of relief from distressing preoccupation. Finer tests have demonstrated a disturbance in the assumption of changing categorical attitudes, to borrow a phrase from Goldstein,[8] and in the function of synthesis, as suggested by Brickner.[9] As Schilder[10] has stated, these patients do not take time to finish up their thinking; they do not think their problems through; they are content with a solution of a sort, even though it may not be the best solution. But how much of this is intellectual, and how much is dependent upon the emotional satisfaction and drive toward perfection is difficult to say. Further work with the blocks as used by Halstead[11]

and with the arithmetical progressions as used by Hunt will be awaited with interest.

Functions of the Prefrontal Areas

From the foregoing observational material, certain hypotheses can be erected concerning the function of the prefrontal areas. These are subject to expansion in the future as new material and more satisfactory analysis of behavior become available, and at most, the hypotheses are very tentative. But they have a bearing on the problem of the desirability of prefrontal lobotomy in altering the personality of the patient.

As far as the truly intellectual operations go, one can afford to be a bit dogmatic and say that intelligence, as ordinarily measured, remains unaffected by prefrontal lobotomy. Yet these frontal areas have a very definite function as regards the utilization of intelligence in the constructive solution of problems under special test situations, and also in the larger situation in life. We would prefer to think of the frontal areas as a sort of focal point where the elements of a situation are gathered together and sorted out, weighted, combined and synthesized, and then the whole problem projected into the future, with the various ramifications followed into the future as far as probability can reach. With intact frontal areas, let us say, a person is able to focus his attention upon any given number of facts under consideration, and then to seek the most logical solution to the problem, exploring future possibilities, contingencies and eventualities. We, as physicians, are called upon to perform this act every time we examine a new patient. This capacity for selection and for pursuing a course of logical reasoning into the future has led us to speak of the projection of the whole individual into the future as a function of the prefrontal areas. It implies imagination, a function, the organic basis for which has been too largely neglected.

As far as we can discern, imagination and foresight are the only strictly intellectual functions that undergo alteration following prefrontal lobotomy; and there is a subtle difference even in this regard. It seems as though activities not directly related to the self are handled much more satisfactorily than the specifically personal ones. Thus some patients are able to carry on their business activities, or practice law, or teach, or even invent rather complex machines, but when it comes to their own image, they seem to lack the ability to form the image of themselves in relation to their surroundings. This was well illustrated in the patient whom one of us demonstrated before the Harvey Cushing Society at its Memphis meeting in 1938.[12] This man was a draughtsman and inventor. After showing his skilfully constructed drawing, he addressed the Society on the value of a health regime to which he attributed his recovery. The prefrontal areas, then, appear to form for ourselves an image of ourselves as we appear to others. Naturally, the capacity for imagination is an extremely important one, and the troubles it may lead us into will be dealt with subsequently.

While there are many related disturbances of function that result from incision of the frontal areas, we believe that foresight and imagination, and consciousness of the self are the only ones that can properly be said to be exercised by these parts of the brain. The other functions that are related to these areas have such a strong affective tinge that we are obliged to consider them as thalamic in origin. The reason that they are so grossly disturbed by prefrontal lobotomy probably resides in the voluminous connection between the prefrontal areas and the nucleus dorsalis medialis of the thalamus. This bundle forms a large portion, if not the whole, of the anterior limb of the internal capsule. Whether the fasciculus cinguli participates in the emotional functioning of the personality, as Papez[13] suggests, is not yet clear.

The emotional charge with which ideas are endowed, is probably mediated by the thalamus through this connection. Emotional responses, as we have seen, are brisk and shallow in those who have been operated upon, hence the frontal areas presumably have a delaying, modifying and repressing effect upon emotional displays. The fronto-thalamic complex, however, probably underlies much of our personal and social activity. Whether it furnishes the energy behind all this is doubtful, since energy of response is apparently a more fundamental characteristic than either intelligence or imagination or feeling tone. It is built into our constitutions with the genes, and this seems to explain the variation in energy response shown by the individuals who

have been operated upon. Following prefrontal lobotomy, the energy response seems to show itself in purer state, uninfluenced by the superstructure of the forward-looking personality. The naturally industrious are freed from feelings of fatigue; the naturally indolent are freed from the necessity of accomplishing.

The frontal areas, then, seem to give us a certain consciousness of ourselves, not only with regard to our bodies and the messages from our viscera, but also with regard to ourselves as persons, as social units, as children of God. We view ourselves in relation to others, and especially in relation to that ideal image of ourselves as we ought to appear, the Ego Ideal of the analysts. Such consciousness is heavily endowed with feeling tone, probably mediated through the two-way connections of the frontal areas with the thalamus.

Psychopathology and the Frontal Lobes

Granted that the frontal lobes mediate the functions of foresight, imagination and consciousness of the self, and that the thalamus supplies a strong affective component through its two-way connection with the frontal lobes, it is not difficult to define conditions under which an individual might develop a psychosis.

In the first place one must assume a predisposed individual, for the most part a rather egocentric, introspective type, with a strong drive toward perfection. In a study of patients later developing involutional melancholia, Eyman[14] and his co-workers have described the claustrophrenic personality as compounded of obstinacy, parsimony and perfectionism. Behind all this we would place the faculty of seeking far into the future for ways in which to attain security. One can observe this same forward-looking tendency in search for security in the psychasthenics with their obsessions, doubts, and phobias, and in the earliest anamneses of schizophrenic individuals. In any event, threatened security constitutes a grave hazard for these personalities, and the faculty of foreseeing difficulties, crossing bridges, and building mountains out of molehills is only too well developed in them.

If the frontal lobes permit us to analyze situations and synthesize the various data in hand, correlate experiences and to follow through in our thinking processes to the ultimate, then any slip in calculation or uncertainty is apt to be magnified. Furthermore, with the selective capacity of the frontal lobes to examine one particular course of procedure, the problem of choice may become too great for the intellectual capacity. Now, a problem solved correctly gives one a sense of relief and pleasure; whereas one that is solved incorrectly may leave a residual of regret or disgust. Worse than either of these is the problem that remains unsolved, since a feeling of uncertainty remains; and if uncertainty is magnified it may easily lead to uneasiness and anxiety. It so happens that the people of whom we are speaking, who try to peer too far into the future in search of security, will not accept the "no answer" solution, and with their perfectionistic attitude toward all things, will return again and again to the attack, to be met with the same blank wall that they arrived at before. They remain hung up, *accroché*, as Janet[15] expresses it, unable to solve the problem and unable to drop it. Then comes in the heightening emotional tension with still further fears for the self, and that fear of losing the mind that is so dear to all neurotics. The problem that was at first intriguing has become, through its insolubility something pervasive, something menacing, something malignant.

Anybody is entitled to a few crazy ideas. What physician is there who has not examined with caressing care an unexplained lump or pain, and gone over his past life in an effort to relate it to some previous experience? If no explanation was readily forthcoming has he not envisaged the possibility of syphilis or tuberculosis or cancer? Also, what physician, in a moment of disappointment, has not attributed his lack of success to the machinations of others, or actually believed, for a short time, in his own worthlessness? *It is the fixation of ideas rather than the ideas themselves that determines the psychosis.* How ideas become fixed is by no means explained, but in the histories of our patients there is often a precipitating event that has, as it were, focused attention upon a given problem, and magnified it to the more or less complete blotting out of the rest of life experience. Just to cite a case in which this was particularly clear, a young woman, six feet tall and weighing 250 lbs., complained of an

overpowering syphilophobia of 12 years' duration. Positive reassurance and negative Wassermanns had been unavailing, and suicide was a definite possibility. When the emergency had been met by prefrontal lobotomy, it came out that Abbie had had some passionate embraces with her sister's boy friend. Between pleasure in the experience and a mixture of guilt and hate feelings for her sister, who was more attractive, with regrets and uncertainty and desire, Abbie was in a highly emotional state; much more so than either the sister or the boy friend.

Within a few days after the episode she noticed a rash over her chest where her telephone instrument rested. The rash lasted only three days, but the thought "Syphilis" flashed through her mind, and remained with her constantly. What syphilis meant to her in terms of social ostracism, frustration in marriage and motherhood, the possibility of infecting others, and so on, may be imagined. Had the rash not appeared, the amatory experience might have been forgotten, but this precipitating factor gave the psychosis its signature.

The ability to abstract, to contemplate, to imagine, to build air castles, to follow a line of reasoning, to speculate about the future, may, if given free rein, involve almost any individual in a maze of doubt that breeds fear. It is bad enough if only this life is envisaged, but when some of these poor sufferers with overscrupulousness, overconscientiousness, overmeticulousness and the like get to speculating about the life after death and their chances of winning through to the life hereafter, here is material for major catastrophes. Fortunately for most of us there are sufficient diversions, and when an insoluble problem presents itself we can say, "to Hell with it," and go back to reading the comic strip. But these poor sufferers, driven by their zeal for perfection, are unable to lay problems aside, unsolved problems become obsessive and prevent satisfactory carrying out of ordinary everyday living.

Consider the careful conscientious individual, the model housewife, whose home is immaculate, whose children are properly reared and meet only the best people, whose parties are noted for their perfection in detail, and so on. Throughout life this lady has chosen between this and that with an eye to the future. This is the type of person who stays up half the night until her adolescent children are all in bed, and yet is ready with breakfast for her husband the next morning. An illness in the family, a misfortune, some threat to security, an unsolved problem arises, and further thought goes into the management of the family, sleep becomes fitful, and fatigue and irritability develop, so that the problem of choice becomes more and more difficult. The change from decisiveness to uncertainty and to vacillating indecision is accompanied by more and more feeling of guilt and futility. Minor incidents are magnified and the threat of the future becomes malignant. As the depression deepens, the practical everyday question "What shall I do next?" becomes shortened, converted, baffling, threatening: "What shall I do?"

It is scarcely worth while at this time to pursue this topic further. However, the fixation of the ideas is of such importance that something further should be said about it. Egas Moniz[16] postulated a certain pathological fixation of cellular connecting groups within the brain as the anatomo-physiological substrate of the fixed ideas. His idea was that by destruction of the pathologically stabilized synaptic patterns he would reduce the brain to a more fluid type of physiological response. Consequently, he planned an operative procedure that would interrupt a large number of fibers in the frontal association areas. Ody,[17] at about the same time, had a somewhat similar idea, namely that the activity of the frontal lobes was perverted in some way by certain lesions that according to his description were similar to those found in the vicinity of infiltrating tumors. Removal of one frontal lobe in his case was followed by moderate improvement in a long-standing case of dementia precox. Neither of these hypotheses is fully satisfying to us. In the first place, we have repeatedly observed the apparent histological normality of the brain in dementia precox, and secondly, the abnormal ideas persist, sometimes for a long period, following prefrontal lobotomy.

Modus Operandi

According to our hypothesis, prefrontal lobotomy acts upon the psychoses by removing more or less completely the emotional component with which the ideas are endowed.

Since the ideas in most of the psychotic patients operated upon have been definitely oriented with regard to the self and its insecurity, this bleaching of the affective tone has been singularly successful in bringing them out of their state of anxiety, worry, apprehension, tension and depression. The ideas may persist, and the reactions to them also, in the form of mannerisms, compulsions and the like, but since the ideas no longer carry such a threat to the security of the individual, and since the motor component no longer serves any particularly useful purpose, these also gradually disappear in the course of time. The individual is freed from the necessity of pursuing a hopeless task of discerning the future in terms of safety for himself, and can look outward and see what is going on in the world outside.

In the operation of prefrontal lobotomy, as at present carried out, the cellular destruction is minimal, and presumably, through association pathways, intellectual processes almost as complex as those in the intact individual can be carried on. Since it seems to have been the emotional component that was instrumental in getting the patient into mental difficulties in the first place, the bleaching of this emotional component alters the personality of the individual and sometimes in rather disconcerting ways, but nevertheless, with the suffering gone, and the brooding intensity of the emotional response, with its storms and its unpredictable outbreaks, life is easier not only for the operated patient, but also for his relatives. Even if the patient is unable to go back to work, a contented drone is better than a complaining one.

Conclusions

The prefrontal regions, man's most distinctive cerebral endowment, are probably concerned with foresight, imagination, and consciousness of the self. Their analytic, synthetic and selective capacity as purely intellectual processes has probably been overstressed. The strong two-way connection with the nucleus medialis dorsalis of the thalamus makes for definite affective toning of ideas, particularly those in relation with the self. The prefrontal regions may be spoken of as projecting the total personality into the future, the energy drive and the emotional component reinforcing the intellectual operations in the quest for the ideal.

In some cases the ideational processes may

TABLE I—PRESENT STATUS OF PATIENTS WITH PREFRONTAL LOBOTOMY

Disease	*No.*	*Regularly Employed*	*Studying or Partially Employed*	*Housekeeping*	*At Home*	*Institution*	*Dead*
Involutional Depressions	38	4	3	12	11	4	4
Obsessive Tension States	18	7		7	2		2
Schizophrenias	12	3	3	1	3	1	1
Psychoneuroses	8	4	1	1	1	1	
Undifferentiated (Schizoid)	4	2		1	1		
Totals	80	20	7	22	18	6	7

TABLE II—RESULTS IN PREFRONTAL LOBOTOMY

		RESULTS			*DEATHS*	
Disease	*No.*	*Good*	*Fair*	*Poor*	*Operative*	*Subsequent*
Involutional Depressions	38	24	10	3	1	3
Obsessive Tension States	18	14	1	1	2	
Schizophrenias	12	6	4	2		1
Psychoneuroses	8	6		2		
Undifferentiated (Schizoid)	4		1	3		
Totals	80	50	16	11	3	4

project the prepsychotic individual so far into the future in his effort to find perfection, or lead into such a maze of uncertainty, that the impossibility of solution lays the individual open to stronger and stronger emotional reactions to his failure. Some precipitating factors serves to fix certain ideas and psychosis develops.

Prefrontal lobotomy, by cutting off the affective component from the ideas that are concerned with the self, radically alters the personality of the individual in that it makes him no longer interested (affectively observant) in himself, either as an integrated collection of organs, or as a unit of society. His mental processes are to that extent simplified, and he can go about the business of living with less than the normal burden of guilt, remorse, indecision, sensitiveness, self-consciousness and fear.

In patients whose life has been made unbearable by the development of persistent obsessive ideas, we believe that prefrontal lobotomy is a constructive method of treatment.

TABLE III—SYMPTOMATOLOGY AND DEGREE OF RELIEF IN 74 CASES*

		RELIEF					RELIEF			
Symptom	*Present Before*	*Persistent*	*Incomplete*	*Temporary*	*None*	*Symptom*	*Present Before*	*Persistent*	*Incomplete*	*Temporary*	*None*
Introversion	73	61	2	8	2	Negativism	23	19	2	1	1
Preoccupation	72	60	2	9	1	Delusions	23	19		3	1
Nervous Tension	72	52	10	8	2	Stereotypy	23	8	12		3
Obsessive Thinking	69	58	2	8	1	Palpitation	22	19		3	
Worry	68	52	7	8	1	Depersonalization	22	19		2	1
Anxiety	68	52	7	8	1	Obsessions	20	18	2		
Depression	66	52	5	8	1	Hallucinations	19	18		1	
Indecisiveness	54	40	10	3	1	Ideas of Influence	18	14		4	
Exhaustion	54	37	10	6	1	Ideas of Reference	15	14			1
Apprehension	54	41	4	9		Compulsions	14	4	8		2
Insomnia	52	36	8	7	1	Disorientation	14	14			
Crying Spells	49	45	1	2	1	Terrifying Dreams	14	13		1	
Suicidal Ideas	47	44		3		Frigidity or Impotence	12	10		1	1
Mannerisms	43	13	24	3	3	Amnesia	12	11	1		
Cold Hands and Feet	43	35		8		Emotional Instability	11	9	2		
Meticulosity	41	39		1	1	Fear of Contamination	8	7	1		
Guilty Feelings	39	36	1	2		Circumstantiality	8	8			
Agitation	39	34	3	2		Dullness	8	4	2		2
Indigestion	34	34				Catatonia	5	4		1	
Psychomotor Retardation	31	26	2	3		Alcoholism	3	1	1	1	
Irritability	31	13	12	3	3	Apathy	3		2	1	
Hypochondria	25	22	1	1	1	Distractibility	3	1		1	1
Suspiciousness	25	19	2	3	1	Hysterical Paralysis	2	2			
Hostility	24	6	7	10	1	Tics and Spasms	2		1		1
Psychalgia	23	20		3		Emotional Deterioration	2				2

*Excluding three recent cases and three operative deaths.

References

1 Freeman, W.: "Surgical Treatment of Mental Disorders," *Med. Ann. District of Columbia*, 2: 345, 1939.
2 Freeman, W., and Watts, J. W.: "Interpretation of Functions of the Frontal Lobes Based Upon Observations in 48 Cases of Prefrontal Lobotomy," *Yale J. Biol. and Med.*, 11:527, 1939.
3 Ackerly, S.: "Instinctive, Emotional and Mental Changes Following Prefrontal Lobe Extirpation," *Am. J. Psychiat.*, 38:291, 1937.
4 Freeman, W., and Watts, J. W.: *Psychosurgery, Intelligence, Emotion and Social Behavior Following Prefrontal Lobotomy in Mental Disorders*, Springfield, 1942, Thomas.
5 Hebb, D. O.: "Intelligence in Man After Large Removals of Cerebral Tissue; Reports of 4 Left Frontal Lobe Cases," *J. Gen. Psychol.*, 21:73, 1939.
Hebb, D. O., and Penfield, W.: "Human Behaviour After Extensive Bilateral Removal from the Frontal Lobes," *Arch. Neurol. and Psychiat.*, 44:421, 1940.
6 Nichols, I. C., and Hunt, J. McV.: "A Case of Partial Bilateral Frontal Lobectomy," *Am. J. Psychiat.*, 96:1063, 1940.
7 Harrower-Erickson, M.: "Personality Changes Accompanying Cerebral Lesions. I. Rorschach Studies of Patients with Cerebral Tumors," II. "Rorschach Studies of Patients with Focal Epilepsy," *Arch. Neurol. and Psychiat.*, 43:859, 1940.
8 Goldstein, K.: "The Significance of the Frontal Lobes for Mental Performances," *J. Neurol. and Psychopathol.*, 17:27, 1936.
9 Brickner, R. M.: *The Intellectual Functions of the Frontal Lobes*, New York, 1936, Macmillan.
10 Schilder, P.: In discussion of Brickner, *Arch. Neurol. and Psychiat.*, 31:1118, 1934.
11 Halstead, W. C.: "Preliminary Analysis of Grouping Behavior in Patients with Cerebral Injury by the Method of Equivalent and Non-Equivalent Stimuli," *Am. J. Psychiat.*, 96:1263, 1940.
12 Watts, J. W., and Freeman, W.: "Results of Prefrontal Lobotomy; Presentation of Patient Operated Upon for an Obsessive Compulsive State," *Confinia Neurologica*, 1:344, 1938.
13 Papez, J. W.: "A Proposed Mechanism of Emotion," *Arch. Neurol. and Psychiat.*, 38:725, 1937.
14 Eyman, E. V., Forster, F., Rivers, T. D., Wright, T. H., and Rome, H. P.: "Involutional Melancholia: A Statistical Survey of Its Biogeneses," *Am. J. Psychiat.*, (in press).
15 Janet, P.: *Les Médications Psychologiques*,

TABLE IV—SYMPTOMS PRODUCED BY PREFRONTAL LOBOTOMY IN 74 CASES*

Symptom	*Total*	*Persistent*	*Temporary*	*Symptom*	*Total*	*Persistent*	*Temporary*
Lack of Initiative	73	30	43	Overactivity	22	6	16
Dullness	66	9	57	Witticisms	18	7	11
Disorientation	65	2	63	Startle Reaction	18	7	11
Euphoria	60	22	38	Lack of Distractibility	17	11	6
Apathy	60	6	54	Impulsive Acts	16	9	7
Fatigability	59	14	45	Perseveration	16	3	13
Fluctuation of Attention	58	7	51	Mannerisms	16		16
Procrastination	56	29	27	Stupor	16		16
Slowness	54	18	36	Decreased Suggestibility	14	12	2
Psychomotor Retardation	54	2	52	Poor Judgment	14	11	3
Lack of Interest	53	5	48	Irritability	14	7	7
Restlessness	53	3	50	Stereotypy	14	2	12
Laziness	52	22	30	Indefatigability	13	10	3
Amnesia	52	1	51	Youthful Appearance	11	10	1
Facetiousness	49	18	31	Aggressiveness	9	4	5
Tactlessness	47	43	4	Elation	9		9
Somnolence	45		45	Profanity	8	2	6
Blunting	41	3	38	Tantrums	7	2	5
Distractibility	38	10	28	Confabulation	7	1	6
Volubility	30	13	17	Catalepsy	7		7
Playfulness	28	8	20	Indecency	6	1	5
Increased Suggestibility	25	16	9	Circumstantiality	5	5	
Emotional Lability	24	11	13	Delirium	1		1
Sarcasm	22	13	9				

*Excluding three recent cases and three operative deaths.

Paris, 1923, Doin.
16 Moniz, E.: *Tentatives opératoires dans le traitement de certaines psychoses*, Paris, 1936, Masson.
17 Ody, F.: "Le traitement de la démence précoce par résection du lobe préfrontal," *Arch. Ital. di chir.*, 53:321, 1938.

Results of Prefrontal Lobotomy

In Tables 1 and 2 summaries are given of our results in the surgical treatment of mental disorders in 80 cases over the past five years. These cases have all been followed for at least a year. There have been three operative deaths, two of them early in our experience with the original leucotome technique of Egas Moniz. Five of the living patients are still institutionalized. Most of the rest of them are sufficiently well to engage in some form of useful work.

TABLE V—NEUROLOGICAL SIGNS PRODUCED BY PREFRONTAL LOBOTOMY IN 74 CASES*

Symptom	*Total*	*Persistent*	*Temporary*	*Symptom*	*Total*	*Persistent*	*Temporary*
Increased Appetite	70	50	20	Monoparesis	4	1	3
Masked Facies	69	5	64	Coma	8		8
Plateau Speech	64	9	55	Ocular Changes	5		5
Vomiting	52		52	Aphasia	4	2	2
Akinesis	49	1	48	Reflex Grasping	3	2	1
Vesical Incontinence	48	4	44	Hemiplegia	4	1	3
Sweating	40		40	Frontal Ataxia	3		3
Blood Pressure Changes	24		24	Staggering	3		3
Rectal Incontinence	15	3	12	Fainting Spells	3		3
Convulsions	10	3	7	Heart Changes	2		2
Babinski Sign	9	2	7	Intolerance to Drugs	1		1
Borborygmus	9		9	Hemichorea	1		1

*Excluding 3 recent cases and 3 operative deaths.

TABLE VI—RESULTS OF PSYCHOMETRIC TESTS OF LOBOTOMY PATIENTS

(Dr. Thelma Hunt)

Changes in Performance Two Weeks After Prefrontal Lobotomy.
(In Percentage of Patients Showing Change.)

	Better Performance	*Poorer Performance*	*Same Performance*	*Difference between Preop. and Postop. Tests Reliable*
Kohs Block Test	33	37	30	No
Cube Construction Test, Speed	58	42	0	Yes
Cube Construction Test, Accuracy	17	25	58	No
Arithmetic Test, Speed	68	32	0	Yes
Arithmetic Test, Accuracy	47	25	28	No
Paper Form Board Test, Speed	43	52	5	Yes
Paper Form Board Test, Accuracy	50	5	45	No
Cancellation Test, Speed	28	52	20	Yes
Cancellation Test, Accuracy	60	15	25	Yes
Substitution Test, Speed	43	57	0	Yes
Substitution Test, Accuracy	0	0	100	No Difference
Color Naming Test, Speed	60	40	0	Yes
Color Naming Test, Accuracy	25	10	65	No
Match-Stick Test	45	10	45	Yes
Coin-Under-Cups Test	73	2	25	Yes

A Statistical Survey of the Biogenesis of Involutional Melancholia*

E. V. EYMAN, M.D.; F. M. FORSTER, M.D.; T. D. RIVERS, M.D.;
T. H. WRIGHT, M.D.; H. P. ROME, M.D.**
Philadelphia, Pennsylvania

Dr. Eyman was graduated from Rush Medical College in 1911. At present, he is Chief of Service, Department for Mental and Nervous Diseases, Pennsylvania Hospital, and is Assistant Professor of Psychiatry, Graduate School of Medicine, University of Pennsylvania.

Dr. Forster was graduated from the University of Cincinnati College of Medicine in 1937 and interned at the Good Samaritan Hospital. He is Instructor in Neurology, Boston University School of Medicine, and is Assistant Physician, Evans Memorial Hospital, and Assistant Visiting Physician, Massachusetts Memorial Hospital.

Dr. Rivers was graduated from Jefferson Medical College in 1926. He was Resident at the Jefferson Medical College Hospital from 1926 to 1928. He was Instructor in Medicine, University of Chicago Medical School, from 1929 to 1930 and is now Psychiatrist at the Institute of the Pennsylvania Hospital and Instructor of Psychiatry, University of Pennsylvania.

Dr. Wright was graduated from the University of Pennsylvania in 1936. He is now Psychiatrist to the Grant Study, Harvard University and a Fellow of the Institute of the Pennsylvania Hospital.

Dr. Rome received his medical degree from the Temple University School of Medicine in 1935. He is on the Staff of Institute of the Pennsylvania Hospital.

This is a statistical survey of the biogenesis of Involutional Melancholia, obtained from an observation of 300 cases hospitalized in the Pennsylvania Hospital of Philadelphia, Department of Nervous and Mental Diseases. The material includes 180 female and 120 male admissions ranged according to hospital census over the period of the past 25 years, the advantages of this being that during this time there have occurred all manner of sociologic, politic, economic and moralo-religious changes, in the way of wars, depressions, periods of prosperity and the advent of new political ideologies. The chosen cases were diagnosed as Involutional Melancholia by the numerous staffs who comprised the diagnostic groups over a period of 25 years. In so doing, we feel we have minimized distortions attributable to the isolated viewpoints of the various schools of psychiatric thought, as well as the emotional bias in the opinions of history-takers.

* From the Department for Mental and Nervous Diseases of the Pennsylvania Hospital, 4401 Market Street, Philadelphia.

**Read at the Ninety-sixth Annual Meeting of the American Psychiatric Association, Cincinnati, May 20, 1940.

Age

The mean age on admission for the female groups was 49.4 years; while for the male patients it was 54.9 years or 5.5 years later in its occurrence. (Graph No. 1.)

Civil Condition

Considering the age of onset in relation to the civil condition in each sex, we find that it occurs later in widows and widowers.

Race

The question of racial occurrence is not predictable since our population sampling is not sufficiently representative.

Heredity

	Women		*Men*	
	No.	*Per Cent*	*No.*	*Per Cent*
History of Psychosis in family	57	31.66	34	28.33
Psychoneurotics or abnormal drinkers in family	11	6.1	17	14.16
Negative	112	62.22	69	57.50
Total	180	99.98	120	99.99

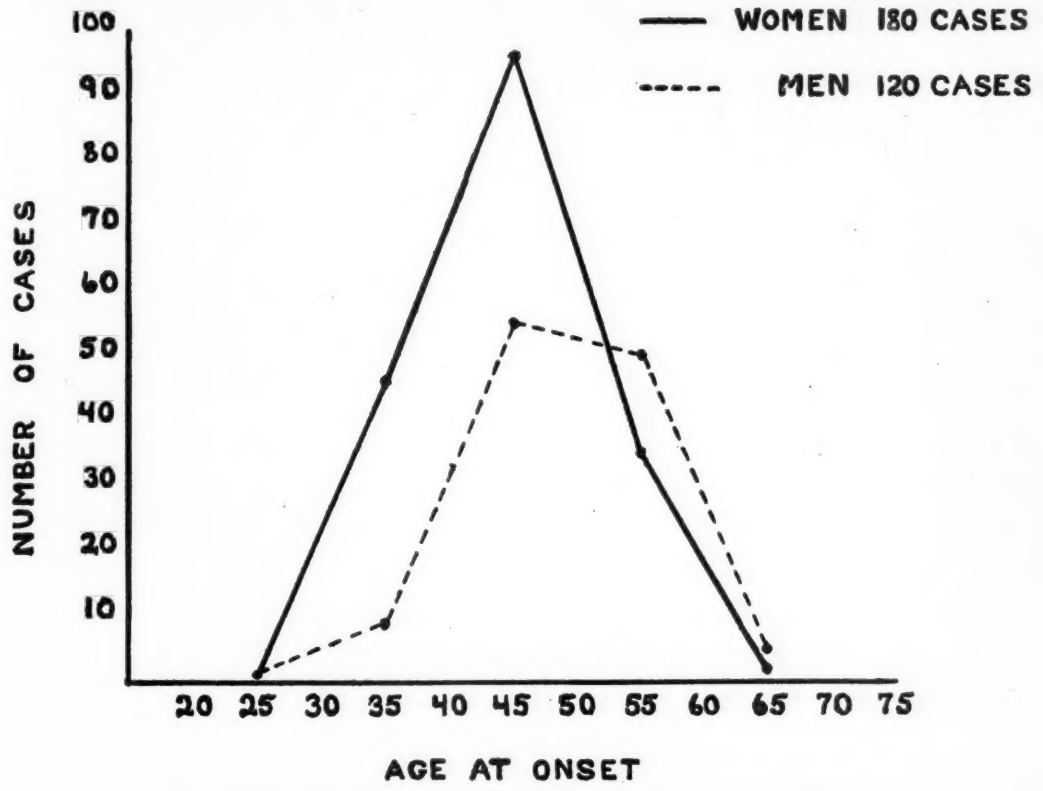
Psychoses were found to occur in the families of 31.6 per cent of the females and 28.3 per cent of the males. In 59.8 per cent of the patients there was no family history of mental illness, while in approximately 10 per cent there was sufficient data to establish a history of psychoneuroses or abnormal drinking in their antecedents or collaterals.

Order of Birth

The position of the patient in birth order was found to be of no consequence.

Education

17.77 per cent of both groups had acquired a college education. This remarkably high figure in comparison to the general population incidence in an era when college education was distinctly the privilege of a few



Graph Chart No. 1—Age incidence at onset of psychosis.

is only partly explained by the economic status and social level of patients in a private hospital. It may reflect the drive and acquisitiveness of their personalities.

	Women		Men	
	No.	Per Cent	No.	Per Cent
Grade School	91	50.55	79	65.83
High School	50	27.77	21	17.50
College	34	18.88	20	16.66
No formal education	5	2.77		
Total	180	99.97	120	99.99

Marital Status

	Women		Men	
	No.	Per Cent	No.	Per Cent
Single	47	26.11	18	15.0
Married	103	57.22	89	74.16
Widowed	22	12.22	10	8.33
Divorced or separated	8	4.44	3	2.50
Total	180	99.99	120	99.99

Involutional Melancholia occurs more frequently in the married groups than in the single, widowed, or divorced even though marriage is less frequent than would be expected in a similar sampling of the population.

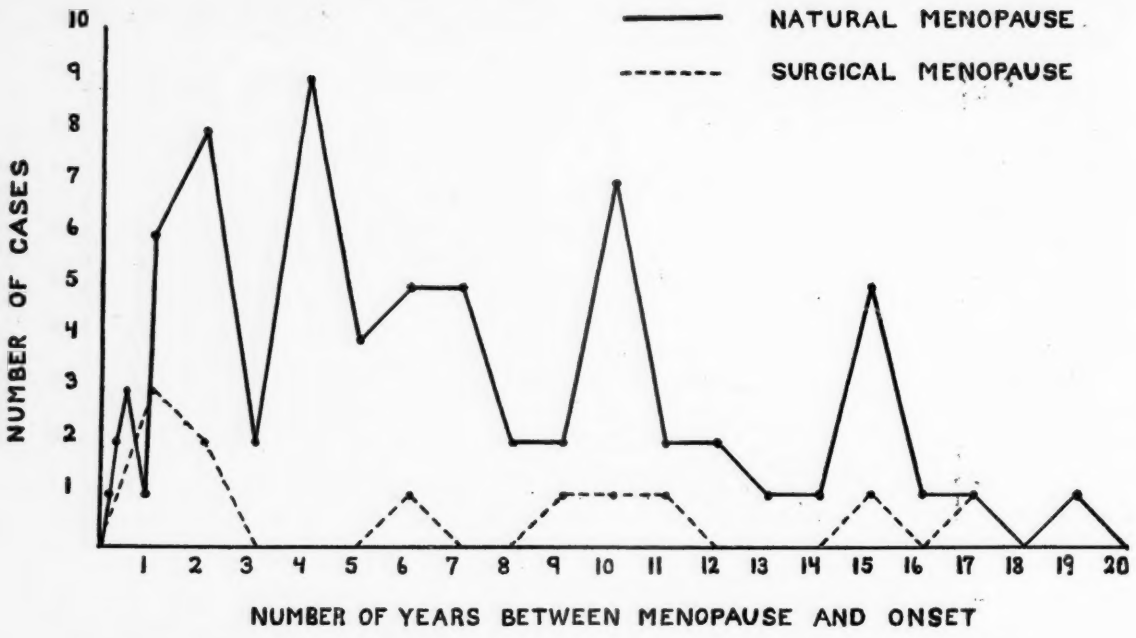
Sexual Maladjustment

In this category only frank maladjustments occurring prior to the onset of the illness were considered. These ranged from frigidity to overt homosexuality. Such deviations from the usual were sufficiently glaring as to justify their being mentioned by the informants. We are well aware that these are by no means true indices. Approximately 25 per cent of the females had gross maladjustments compared with 16 per cent of the males.

	Women		Men	
	No.	Per Cent	No.	Per Cent
Positive History	21	26.57	17	16.03
Negative History	50	70.42	89	83.96
	71		106	
Inadequate History	109		14	
Total	180	99.99	120	99.99

Number of Children

The average number of children of the female group was 2.9 whereas it was 2.8 for the male group, which is somewhat below the number of children of the average Ameri-



Graph Chart No. 2—Frequency curve illustrating time interval between cessation of menses and onset of psychosis. 19 cases of surgical menopause are too few to give a significant curve, but illustrate time distribution.

can family. In 1920 the average American family included 4.3 children.

Relationship With Children

In 40 per cent there is a history of abnormally close relationships. This is of the overly solicitous, sheltering, anxious, closely identified variety. In another 10 per cent of the group this same situation probably exists.

Menopause

	Number	*Per Cent*
Not occurred	21	18.10
Concurrent with illness	24	20.68
Occurring prior to illness	71	61.20
No information	64	
Total	180	99.98

The only adequate evidence obtained in regard to the menopause was that of actual cessation of menses. This was computed from the onset of the illness as determined from the history. Menopause occurred prior to the illness in 61.2 per cent; concurrent with the illness in 20.6 per cent, and had not occurred in 18.1 per cent. Considering the frequency distribution curve of patients who had a prior menopause, there is a striking skew deviation without sufficient evidence of conformation to a true frequency curve which would establish etiological significance. (Graph No. 2.) In patients who had had surgical menopause, there was likewise no evidence of significant relationships.

Prepsychotic Personality

The classical prepsychotic personality, which has been amply described elsewhere,[1,2,3,4,5] we found to be characterized by the triad of obstinacy, parsimony and perfectionism.

Those individuals who are recorded here as having a typical prepsychotic personality contain in their histories such statements as these: "They were 'just so' people"; "He was always worried about things"; "She was an exceptionally good manager"; "He was a hundred per center"; "He would never give an inch." These statements, taken from actual case histories, were not in response to leading questions by the historian, since the histories antedated the concept of a typical prepsychotic personality.

The term claustraphrenia we feel is all-inclusive in its connotations, expressing this typical rigidity of personality. The typical picture is that of the worrisome, overly conscientious, scrupulous individual, a careful manager in the household, an indefatigable worker, a self-sacrificing, self-abnegating parent whose propensities for detail are an

index of his perfectionism and ill concealed sense of insecurity.

	Women		Men	
	No.	Per Cent	No.	Per Cent
Claustraphrenic	111	85.38	83	91.20
Non-claustraphrenic	19	14.61	8	8.79
	130		91	
Insufficient information	50		29	
Total	180	99.99	120	99.99

Precipitating Factors

	Women	Men
Death of relatives	37	12
Somatic disease	12	11
Financial worry	10	28
Intra-familial friction	14	6
Changes in environment	7	9
Worry over menopause	5	
Worry over war (1918)	3	
Non-financial business worries		7
Total	88	73

In the consideration of precipitating factors, events of importance to the individual occurring with definite time relationship to the onset of the illness, were taken to be significant. In roughly 50 per cent of both groups these were noted. Their nature varies strikingly with the sex of the patient. Death of relatives in the female group occurs more than three times as frequently as any other cause, whereas in the male group death of relatives and somatic diseases were of equal significance but occurred less than half as frequently as a cause than did financial anxiety. Farquharson,[6] in an analysis of 730 consecutive cases of unclassified melancholia studied in England in 1894, says, "Business anxieties constituted the common moral cause amongst the men, domestic affliction amongst the women." We visualize the precipitating factor as signifying the loss of a dearly-bought security which naturally lies in different channels for each sex.

Symptomatology

We have divided these 300 cases into four general types dependent upon the predominance of trends recognized in descriptive psychiatry as bases for classification. All patients were by the nature of the illness depressed and agitated. When this constituted the greater bulk of the descriptive picture it was called claustraphrenia simplex. When in addition to the depression and agitation, delusions indicative of paranoid trends were present, these patients were considered as claustraphrenia paranoia. The claustraphrenia asomatica group presented somatic delusions even to the extent of depersonalization. And, finally, there was a mixed group, claustraphrenia compositus, which showed an admixture of paranoid and somatic delusions in addition to their agitation and depression.

	Simplex		Paranoia	
	No.	Per Cent	No.	Per Cent
Women	68	37.77	62	34.44
Men	17	14.16	23	19.16
	Asomatica		Compositus	
	No.	Per Cent	No.	Per Cent
Women	33	18.33	17	9.44
Men	23	19.16	57	47.5

Prognosis

	Women		Men	
	No.	Per Cent	No.	Per Cent
Recovered	49	32.77	30	25.00
Improved	38	21.11	21	17.50
Unimproved	51	28.33	42	35.00
Dead	22	12.22	23	19.16
Suicide	10	5.55	4	3.33
Total	180	99.98	120	99.99

The mean time for recovery in the female group was 2.81 years while the unimproved group of the same sex follow up time was 5.27 years. For the male group mean recovery time was 3.46 years while for the unimproved group of this sex the mean follow up time was 5.38 years. Statistically, it is obvious that the unimproved patients have been followed sufficiently long to warrant saying they will not recover.

The only factor which we are able to estimate to be of importance in the prognosis is the age of the patient. The younger patients have a larger recovery rate. Contrary to the generally accepted feeling, adjustment difficulties in the pre-illness life—sexual and social maladjustments, hallucinosis and somatic delusions—have no striking significance mathematically in this series in altering the prognosis. Evaluation of the rigidity of the personality and its bearing on the prognosis was inestimable in this series. Insofar as the

result time is concerned, it was found to vary from one month to eleven years. Contrary to general belief, it was learned that 25 per cent of the recovered patients had attained their recovery after five years from the onset of the illness.

In conclusion, we feel that this survey establishes Involutional Melancholia as an illness occurring in individuals about the fifth decade of life, the only demonstrable etiology being a personality prerequisite best described as claustraphrenic in that it connotes inflexibility at a time demanding adjustment and adaptation. The coincidental occurrence of the climacteric has been shown to have no etiological significance in the causation of the illness. In more than a third of the patients there is a positive family history of mental illness. Their inelastic personality traits are clearly demonstrable in their inability to share responsibility, their unwillingness to grant independence to their children and in the narrowness of their social outlets. When, in the course of living, death or other losses threaten their security, this life long pattern of orderliness is violently disrupted by an illness from which only one out of three recover spontaneously. The trend which it takes is a classical mourning for their lost security, personalized to the exclusion of all other interests.

References

1 Titley, W. B.: "Prepsychotic Personality in Inlutional Melancholia," *Arch. Neurol. and Psych.*, 36:19, 1936.
2 Lewis, A. J.: "Melancholia—A Clinical Survey of Depressive States," *J. Ment. Science*, 80:277, 1934.
3 Muncie, W.: "Rigid Personality as a Factor in Psychosis," *Arch. Neurol. and Psych.*, 26:359, 1931.
4 Henderson, D. K.: *The Affective Reaction Type Including Involutional Melancholia; Psychiatry for Practitioners*, Oxford University Press, New York, 1939.
5 Palmer, H. D., and Sherman, Stephen H.: "The Involutional Melancholia Process," *Arch. Neurol. and Psych.*, 40:762, 1938.
6 Farquharson, W. F.: "On Melancholia — An Analysis of 730 Consecutive Cases," *J. Ment. Science*, 40:11, 1894.

Clinical Chronaxie*

JOSEPH MOLDAVER, M.D.
New York, New York

Dr. Moldaver received his medical degree from the University of Brussels, Belgium, in 1925. He was in charge of the Laboratory of Electrology at the Neurological Center of Brussels and Research Fellow in Neurophysiology at the University of Brussels. Since 1940 Dr. Moldaver is Research Assistant in Neurology, College of Physicians and Surgeons, Columbia University; and Junior Assistant Neurologist at the Neurological Institute of New York.

Introduction

The solution of the problem of measuring chronaxie through the skin has placed a rigorously precise method of electrodiagnosis in the hands of the clinician. The numerous imperfections and errors of the older method of electrodiagnosis by galvanic and faradic currents are well known. However, measurements of chronaxie are objective signs of great clinical value.

Physiological Basis — "Useful time," rheobase, and chronaxie. The minimum strength of current necessary to obtain the threshold of an excitation of nerve or muscle is not the only factor involved; the duration of flow must also be considered. The intensity of current necessary to obtain the threshold becomes higher for a given structure as the duration of flow becomes shorter, and it is possible to plot a curve of excitability for each structure, in terms of the intensity of the current and its time of passage. This curve (Hoorweg's or Weiss' curve) is an equilateral hyperbola. As the curve reaches the asymptotic region, the time during which the current is applied no longer has an important effect on the threshold of intensity. In other words, at a certain point, duration ceases to be a factor in excitability. The period during which time plays a role in excitability is called *"useful time."*

"Useful time" varies for different muscles; for instance, the useful time of the frog's gastrocnemius is measured in milliseconds and the useful time of smooth muscles like the frog's stomach is measured in seconds. The curve has the same shape but the time units are different. Each muscle has a char-

* From the Department of Neurology, College of Physicians and Surgeons, Columbia University, and the Neurological Institute, New York.

acteristic useful time, but the measurement of this factor is technically difficult.

Louis Lapique chose arbitrarily a definite point on the curve at the point where the slightest variation in time changes the intensity of the threshold. He begins by determining the galvanic threshold in each instance. This involves the passage of current over a relatively long period of time, since it is determined by the manual manoeuvre of pressing on a key to close the current and removing the finger to open it. No matter how rapidly this is done, the time of passage of the current is always more than 5 milliseconds, which is greater than the *"useful time"* of striated muscles. The galvanic threshold is called the rheobase (rheos-current; basis-base).

Chronaxie is determined from the rheobase. In order to measure chronaxie, an intensity of twice the rheobase is used and with this doubled intensity the minimum period of time during which it must be applied to produce a response is determined and plotted on the curve. This time is called "chronaxie" (chronos—time; axia—measure). Chronaxie is, therefore, the time of passage of current necessary to reach the threshold of excitation with an intensity of twice the rheobase. The rheobase or galvanic threshold varies with experimental conditions: size of electrodes, tissue resistance, etc., while chronaxie varies only with excitability. Clinically, it is a remarkably precise method of measurement.

Method and description of the apparatus—Generally monopolar electrodes are used as in ordinary electrodiagnosis; a large indifferent electrode is applied to the thorax and a small exploratory electrode is used to excite the nerve or muscle. Non-polarizable electrodes of silver chloride are used. The total resistance of the apparatus is constant (11,000 ohms) under all conditions. Condensor discharges are used to give electrical currents of short duration. Since the resistance is constant, a given capacity always corresponds to the same time of discharge of current.

A 300 volt continuous current is furnished either by batteries or by a transformer. The rheobase is read from a milliammeter and a voltmeter. There is a series of condensors from 0.0005 micro farads to 50 micro farads. An automatic device doubles the current when passing from the rheobase threshold to the threshold which measures chronaxie. A double contact key allows one to alternate the direction of passage of the current, thus avoiding polarizing the skin. Measurements are usually taken with the negative pole.

First the rheobasic threshold is determined, then the apparatus is switched to the condensors and the current is automatically doubled. The new threshold is determined at the same point for the two measurements. Thus in a muscle the same fibers are explored. If this first and important precaution is not taken, the error of finding the rheobasic threshold of certain fibers and measuring a false chronaxie in other fibers might be made.

Knowing the constant resistance of the circuit and the time of the condensor discharge, it is easy to calculate the time of passage of current which is necessary to obtain the threshold with the intensity of twice the rheobase. With our apparatus, we multiply the condensor number by (the constant) 4 to obtain the chronaxie; in other words, a capacity of 1 micro farad corresponds to a chronaxie of 4 milliseconds. The following example is taken from the measurement of chronaxie in a biceps: the rheobasic threshold is obtained with 50 volts, the switch is thrown to condensor discharge, and the current automatically doubled to 100 volts. The threshold of excitation is found with the condensor of .03 micro farads. This number is multiplied by the time constant 4, and the result is .12 milliseconds which is a normal chronaxie for the biceps.

Normal Value and Distribution of Human Motor Chronaxies

(1) The chronaxies of human skeletal muscles vary between .06 and .70 milliseconds. They are classified by Georges Bourguignon in 3 groups.

Short chronaxie	.06 to .14
Medium chronaxie	.16 to .32
Long chronaxie	.40 to .70

(2) In each segment synergic muscles have the same chronaxie. (This law has been confirmed by various authors for the whole animal kingdom.) The distribution of chronaxie is thus found to be functional; each nerve or nerve root, therefore, can contain fibers with different chronaxies.

(3) In each segment the chronaxie of the

ventral muscles is found to be approximately half that of the dorsal muscles, and in each limb the chronaxie of the proximal segment is approximately half that of the distal segment.

Almost all of the ventral muscles have each one chronaxie. Each dorsal muscle has two chronaxies corresponding to two different motor points. One of these chronaxies is almost twice that of the ventral muscle and corresponds to the antagonist part of the muscle; the other part of the muscle has the same chronaxie as the ventral muscle and its action is synergistic. An example is the biceps; its chronaxie is from .06 to .14; the triceps has two parts with the approximately double chronaxie of .16 to .32 for the lateral head and long head. However, the chronaxie of the medial head is the same as that of the biceps. Physiologically this part of the muscle is a synergist of the biceps and the medial head of the triceps contracts at the same time as the biceps when the arm is flexed.

The chronaxie of the sensory nerves has been studied, and seems to correspond approximately to the chronaxies of the underlying muscles; this refers to tactile sensibility. Electrical excitation of the eyeball causes a luminous phosphene which varies between 1 millisecond and 4 milliseconds, and corresponds to the chronaxie of the optical nerve.

Vestibular chronaxie is measured by the deviation of the head after electrical excitation. It varies between 12 milliseconds and 22 milliseconds, and is therefore much higher than the chronaxie of skeletal muscles.

Variations of Chronaxie in Pathology

A muscle will have its normal chronaxie only if all its neurones: central, peripheral, motor, and sensory, are normal. The most marked modifications of chronaxie are found in neuromuscular degeneration. This point will be more fully described because of its great clinical importance.

(1) *Neuromuscular Degeneration.* We shall take as an example the section of a motor nerve. The muscular fibers will all degenerate; this process becomes very evident in about 20 days. The chronaxie of the muscular motor point will diminish for a brief period and then will become considerably higher. In a short time (about 48 hours), stimulation of the nerve will give no response in the corresponding muscles. The muscular fibers will lose their characteristic rapidity of contraction and show instead a slow contraction resembling that of smooth muscles. Slow contraction corresponds to a high chronaxie.

One can describe approximately the different phases through which the muscular fibers pass in the following way:

First degree: Contraction is normal, but the chronaxie is already high, and can reach ten times the normal figures indicating the beginning of degeneration the first days of the lesion.

Second degree: Contraction is still rapid but a slowing of the decontraction can be observed. The chronaxie will be ten or fifteen times the normal figure.

Third degree: The muscle presents the phenomenon of galvanotonus: It maintains its contraction throughout the passage of the current and the decontraction is definitely slow. The chronaxie will vary from fifteen times the normal figure to ten milliseconds.

Fourth degree: The contraction and the decontractions are slow; the chronaxie varies between 9 and 20 milliseconds.

Fifth degree: The contraction of the muscular fibers is very slow; the chronaxie can reach 60 milliseconds.

The foregoing picture shows the evolution of total degeneration of muscular fibers. But clinically the majority of cases are in the category of partial degeneration; only a part of the nervous and muscular fibers are involved. In partial degeneration normal fibers are found which can be excited by the nerve and which have a nearly normal chronaxie. There are also degenerating fibers such as those seen in total degeneration. However, the chronaxie of these injured fibers does not usually reach the high figures found in total degeneration. The chronaxie of the nerve will be nearly normal. It must be noted that the picture of total or partial degeneration is a group of transitory symptoms constantly changing; these must be followed by serial examinations. If a sectioned nerve does not regenerate, the muscular fibers will disappear. In a muscle of this type the chronaxie will be normal but the rheobase will be high because the fibrous tissue which is intermingled with the muscular fibers will oppose

the passage of current and the latter must be increased to reach the threshold. The muscle, therefore, will have a higher resistance and a lower amplitude of contraction. The different phases which were described above can be seen in lesions of any part of the motor neurone: motor cell, anterior root, and peripheral nerve.

(2) *Central Lesions.* In the case of central lesions, the modifications are generally slight and are seen in the functional balance between protagonists and antagonists. An example is the case of spastic hemiplegia where the chronaxie of the extensors is high and the chronaxie of the flexors is low. In Parkinsonian rigidity, there is an equalization of the figures for the chronaxies of the agonists and antagonists.

(3) *Primary Muscular Disorders.* In myopathies the chronaxie may be higher than normal, but there is generally no neuromuscular degeneration; myotonic contraction is sometimes found. In Thomson's disease the chronaxie of the myotonic fibers is extremely high, often higher than the figures found in Wallerian degeneration.

(4) *Disturbances (Not Involving Lesions of the Nervous System).*

(a) In certain circulatory disturbances, for example arteritis obliterans, the chronaxie may be higher than normal in the regions where the circulation of the blood is insufficient. The picture may in certain cases be similar to that of Wallerian degeneration.

(b) In tetany there are variations from the normal figures of chronaxie particularly in the interosseus muscles of the hand.

(c) In myasthenia, chronaxie rises when the muscle becomes fatigued for example after a short faradization.

Conclusions

The measurement of chronaxie is at present the most precise method available for electrodiagnosis. It forms a complement to clinical neurology. There have been many theoretical discussions on the mathematical basis of chronaxie, but these have no bearing on its clinical value. The measurement of chronaxie can be of aid in many clinical problems, particularly in differential diagnosis. Chronaxie can be used to determine to an exact degree the physiological alteration; it can often discover an early lesion which shows no clinical signs. In cases of degeneration the course can be followed and the prognosis determined. It must be noted that the degree of degeneration is not sufficient to determine either the diagnosis or the prognosis. It is obvious that a total degeneration in a case of neuritis is not as serious as a partial degeneration in a case of myelitis.

In other words, chronaxie must be considered in the same light as any other laboratory test. The diagnosis and prognosis depend on the combination of the electrical and the clinical examinations. The diagnosis will undoubtedly be aided by the determination of the degree of electrical change and its distribution; the course of these changes will help to establish the prognosis.

The author would like to express his thanks to Dr. Justin Greene, for his help in preparation of the manuscript, and to Mr. C. P. W. Walter who constructed the clinical chronaximeter.

References

Barron, D. H.: "A Comparison of the Time Relations of Muscles Supplied by Normal and by Regenerated Nerves," *Am. J. Physiol,* 103:651, 1933.

Bean, J. W.: "An Attempt to Use Chronaxie as a Measure of Excitability," *Am. J. Physiol.,* 107:275, 1934.

Bourguignon, G.: *La Chronaxie Chez l'homme; Etude de Physiologie Generale des Systemes Neuromusculaires et des Systems Sensitifs, Paris, Masson,* 1923.

Buchanan, D. N., and Garven, H. S. D.: "The Chronaxie in Tetany," *J. Physiol.,* 62A:115, 1926.

Davis, H., and Forbes, A.: "Chronaxie," *Physiol. Rev.,* 16:407, 1936.

Davis, H.: "The Relationship of the Chronaxie of Muscles to the Size of the Stimulating Electrode," *J. Physiol.,* 57:Lxxxi (Proc.), 1923.

Frederick, H.: "Chronaxie; Testing Excitability by Means of a Time Factor," *Physiol. Rev.,* 8: 501, 1928.

Hill, A. V.: "The Intensity-duration Relation for Nerve Excitation," *J. Physiol.,* 83:30, 1935.

Lapicque, L.: "The Chronaxie Switching in the Nervous System," *Science,* 70:151, 1929.

Lapicque, L.: *L'excitabilite en Fonction du Temps; la Chronaxie, sa Signification et sa Mesure.* Paris, Presses Universities de France, 1926.

Lapicque, L.: "Has the Muscular Substance a Longer Chronaxie Than the Nervous Substance?", *J. Physiol.,* 73:189, 1931.

Malamud, W. E.; Lindemann, E., and Jasper, H. H.: "Effects of Alcohol on the Chronaxie of the Motor System," *Arch. Neurol. Psychiat.,* 29:790, 1933.

Moldaver, J.: "De l'electrodiagnostic Classique a la Chronaxie Clinique," *Le Scalpel,* 82A:513, 1929.
"L'electropronostie des Lesions des Nerfs Peripheriques," *Ann. Med. Leg.,* 15:943, 1935.
"La Poliomyelite Epidemique; Electropronostic et Intervention Electrotherapique," *Rev. Bel. Sc. Med.,* 5:119, 1933.

Rushton, W. A. H.: "The Time Factor in Electrical Excitation," *Biol. Rev.,* 10:1, 1935.

Psychoneurocardiovascular Disorders

Peripheral Vascular Neuroses

GEORGE HERRMANN, M.D.*
Galveston, Texas

Dr. Herrmann was graduated from the University of Michigan Medical School in 1918. He is certified by the American Board of Internal Medicine; and is a member of the Association of American Physicians, the American College of Physicians, the American Society for Clinical Investigation, the American Clinical and Climatological Society, and the American Society for Experimental Pathology. Dr. Herrmann is Professor of Clinical Medicine, Texas University School of Medicine.

General Vasoconstriction Neurovascular Disorders

Essential Hypertension or the Hyperpiesia of Sir Clifford Allbutt—Among the general circulatory disorders we might consider as a disorder resulting from psychogenic or neurogenic vasomotor, or vasoconstrictor impulses, that most common condition encountered in everyday practice, namely *essential hypertension* or the hyperpiesia of Clifford Allbutt. It seems to me quite plausible to assume that exaggerated nervous impulses arising under the excessive stress and strain of modern life, may cause in susceptible individuals, particularly those with a predisposing hereditary background, a constriction of the arteriolar bed of the kidney. There results a more or less transient ischemia of the kidney, and a vicious circle is inaugurated in that some humeral substance released from the ischemic kidney sensitizes the arteriolar musculature—an overactive neurovascular mechanism causes general arteriolar spasticity which later results in vascular damage.

Individuals with poor vascular protoplasms and perhaps a slightly more irritable sympathetic nervous system or more sensitive vascular tissues, respond more dramatically with a persistence of the increased tension for longer periods of time. After a while less and less severe nervous shocks are necessary to produce the rise in blood pressure, and the latter becomes more and more persistent until eventually the irritable arteriolar wall becomes hypertrophied, the arteriolar lumen narrowed and finally fibrosis and sclerosis intervene and permanent reduction of the caliber results and hypertension becomes established.

The recent attempts, however, to control essential hypertension by ablation of the dorsal segments of the sympathetic system or the resection of the greater and lesser splanchnic nerves and part of the intervening sympathetic cord, are partially successful. Only one in four selected cases, even when operated upon early before the hypertrophy and fibrosis of the arteriolar wall have appeared, has been benefitted. Then, too, the vascular tone seems to return locally in the arteriolar bed even after the vasoconstriction mechanism has been entirely eliminated. The arteriolar wall, though denervated, gradually resumes its tone and the blood pressure slowly comes back to its original levels.

Nothnagel's Syndrome or Vascular Crises of Pal—In extremely nervous patients, one may occasionally encounter distressing symptoms of paroxysmal vascular spasms which are apparently the result of storms of intense autonomic and sympathetic impulses, sharply increased vasomotor tone and augmented heart action in patients who have no organic cardiovascular disease. Both of these conditions are quite distressing, but are primarily of nervous origin. A vascular crises may be present occasionally and be quite difficult to differentiate from other vascular disorders, as essential hypertension or paroxysmal hypertension, associated with the renal cortex tumor or Cushing's syndrome. Neurogenic vascular crises are usually independent of any bodily exertion and are not likely to follow eating and exertion, but are precipitated usually by emotional psychic upsets, alcoholic debauches or exposure to cold.

The symptoms consist of great anxiety, severe giddiness, a sense of swelling and constriction of the neck with suffocation, heavy and slow palpitation, a feeling of pressure in the breast and usually a tearing sensation in the arm. Gut spasm, nausea, vomiting, coldness, and clammy sweating may develop promptly. Pain, however, is not essential. The patients complain of precordial oppres-

* Professor of Medicine, University of Texas, Director of the Cardiovascular Service in the John Sealy Hospital.

sion, a fear of death, a sense of suspended animation, urgent dyspnea and panting. There is evident and related early facial pallor, probably the result of easy drainage but generally pallor rapidly evolves, and the hands and feet become cadaveric, pallid, cold and numb and the muscles may twitch. The clinical picture is one of shock and imminent collapse, but the blood pressure is elevated. The vascular reactions precede and persist after the pain. Therefore, the vasoconstriction may not be considered the cause of nor the result of the factor. The status of the coronary arterial bed is inconstant yet no deaths have been recorded as the result of Nothnagel's Syndrome. Morphine sulphate, 1/4 gr. with atropine 1/75 gr. is most generally effective. Papaverine and nitrites are rational therapeutic agents in this condition. Lumbar puncture with drainage of some spinal fluid and the slow intrathecal introduction of 100 mm. of procaine may be necessary to interrupt a vasospastic crisis.

Local Vasoconstricting Neurovascular Disorders

Local disorders with vasoconstriction occur more commonly in the upper extremities than in the lower extremities, in which the vasomotor tone is normally more intense. While there is still much support for the central nervous system and more specifically the diencephalic origin of the vasoconstricting stimuli, there is accumulating evidence of local pathological vascular changes with hyperirritability of some of the small arterial walls. As a rule, all of the digits are involved in the process sometimes more completely than at other times.

Persistent Digital Syncope—Occasionally a single finger, following some unusual occupational trauma as a deep sawing cut or a felon, will result in a more or less permanently cold subcyanotic finger. The symptoms may be intensified by emotional stress. The part is numb but may be very painful, and is not very responsive to the addition of warmth or vasodilators.

Paroxysmal Local Digital Syncope — Raynaud's disease or syndrome is usually a quite characteristic paroxysmal phasic, usually bilateral peripheral or digital vasoconstriction. All the fingers of both hands are commonly involved in the reactions in young women of a nervous makeup. The feet and toes are much less often the seat of the disorder. Cold is usually the stimulus that will precipitate an attack. At temperatures of 15 degrees Centigrade or 60 degrees F. or lower, there will result a characteristic series of changes.

At the onset in the fingers with the stage of syncope there is numbness and stiffness and pallor that lasts a few minutes or longer. These are the results of temporary digital arterial spasm. Then in the stage of asphyxia, the prickling sensation is increased to severe actual excruciating pain with increasing cyanosis of the fingers. This apparently is due to the dilation of the venous limb of the capillary bed. Dilation of the digital arterioles and arteries resulting from the anoxemia, the stage of reactive hyperemia, appears with throbbing and swelling of the fingers at the conclusion of the paroxysm. Normal circulation in all the pathways is then reestablished.

Chronic repetition of these attacks naturally results in some changes in the arterioles and in disturbances in the skin and nails of a trophic nature. There may occur dry gangrene of the surface or some hardening of the skin and shrinkage of tissue, so-called scleroderma and sometimes terminal phalangeal changes.

Lewis, Pickering and others described Raynaud's phenomenon occurring in various types and in other conditions produced by intermittent nervous spasm of the peripheral arteries as somewhat more persistent paroxysms with local nutritional changes; still more persistent spasm with general scleroderma; traumatic angiospastic states with local injury; arterial disease from crutch pressure or cervical rib; syringomyelia; ergotism; the cause of hemoglobinuria from cold; phenol poisoning; infectious arteritis in the young; ball valve thrombus; thrombo-angitis obliterans and arteriolar disease in the aged.

Overactivity of the vasomotor system of diencephalic origin has been held responsible for the vasospasm of Raynaud's disease. Pregangleonic cervical sympathectomy has been successfully employed to relieve the condition. The condition is related to the angioneuroses and angioneurotic edema. Lewis and his associates have, however, insisted that local sensitivity of the digital major arteries and the walls of the arterioles are the primary cause for this condition.

Differential diagnosis is largely based on the long history of characteristic recurrent attacks without persistent changes in early vascular disease. When gangrene has occurred, diagnosis is difficult because organic conditions may show some vasospasm in addition to the occlusive disease. The persistence of the pulses in the major peripheral arteries and the usual relief with the use of mecholyl, and the usual precipitation of an attack by immersion of the fingers in cold water (15 degrees C., 60 degrees F.) for 10 to 15 minutes in 75 per cent of cases, are significant diagnostic points.

Treatment of Raynaud's phenomenon varies according to the specific condition present. If there is a great deal of spasm and no organic damage, mecholyl hydrobromide will completely relieve the patient. Other sedatives will help in such cases. Prophylactic measures to protect the part against the cold should always be carried out. The hands which are always exposed should be protected by warm gloves. When an attack comes on, friction with alternate dipping in tepid and cool water should be tried first.

In those patients in which there is a high degree of spasm the immersion in water at 45 degrees C. of one of the extremities and the taking of temperature in one of the others along with novocaine nerve block, serves as a test for the effect to be expected of Smithwick's sympathectomy of cervical preganglionic fibers. Lumbar sympathectomy in which preganglionic fibers alone were cut, was from the beginning uniformly successful in relieving paroxysmal attacks. In a large percentage of the cases novocaine in 1 per cent solution injected in the peripheral nerve gives evidence as to how much vascular damage has been done as well as to show what grade of relief may be expected of sympathectomy. Postganglionic fibers should not be removed because they increase sensitivity to adrenalin. Smithwick's operation seems to be most desirable.

Acrocyanosis—Blueness of the skin of the extremities is not a very uncommon finding in normal individuals when they are exposed to cold. In some individuals it takes much less lowering of the temperature to precipitate the sign. In others, particularly the tall asthenic individuals, with long arms and legs, a duskiness and greyness of the hands and feet is present most of the time. The fingers are more commonly and severely affected than the toes. The ears and the nose may be blue in some patients. Acrocyanotic patients have a sensation of coldness and of swelling of the parts.

On examination, in addition to the coldness, there is usually a clamminess due to perspiration and a feeling of infiltration that often accompanies changes in the nutrition of the skin. There may be other evidence of peripheral vascular disease. Acrocyanosis is merely an exaggerated symptom. It may come on after prolonged exposure to intense cold or following chilblains. Microscopic examination will show the venous limb of the capillaries to be dilated and the blood flow to be retarded. Exposure to cold exaggerates the picture but rarely causes pain. Warmth is more likely to give abnormal, slightly unpleasant sensations. The disorder may be associated with the habits of the individual and his endocrine function. It begins perhaps with pituitary, thyroid, and gonadal insufficiency. Sympathectomy has been used with some success in a few cases. Passive vascular exercise may help.

General Vasodilatation Neurovascular Disorders

Essential, Constitutional, Postural Hypotension—General vasodilatation may result from poisoning in workers exposed to nitroglycerin. Generalized dilatation or angioparesis may produce a state of hypotension, shock or forward failure. Persistent vascular relaxation in the splanchic area gives rise to postural or orthostatic hypotension. In postural hypotension, the patient on arising does not have the normal reflexes and as a result he bleeds into the vascular bed in the lower part of the abdomen. His systolic blood pressure, therefore, drops and he suffers cerebral anemia. These conditions will not be discussed at this time.

Local Vasodilation Neurovascular Disorders

Erythromelagia or Erythralgia—Local angioparesis or vasodilatation is exemplified by *Wier Mitchell's* phenomenon or erythromelalgia. This is localized vasodilatation of obscure etiology which is most probably associated with disturbed histamine metabolism. Most frequently both lower limbs are involved

but the disorder may be unilateral. The affected part becomes red, hot and painful. The phenomenon occurs in paroxysms brought on by warmth and by physical activity. Alcohol is known to make the symptoms worse. The skin flushes and there is throbbing, a sense of fullness and swelling of the part, which promptly subsides. However, there is some persistence of heat. Intravenous injections of histamine diphosphate 2.72 mg. in 1 cc. equal to 1 mg. of basic histamine is diluted in 250 cc. of normal saline solution and given slowly not more than 2.5 cc. of the diluted solution per minute, may relieve the distress. Occasionally, only mild symptoms a' paresthesias occur in these patients and changes in the skin capillaries may result from stasis of the blood with secondary dermatologic lesions.

Erythrocephalagia has been described as affecting the vessels of one side of the face and of the head with an excruciating headache, vertigo, throbbing in the head and side of the head and epiphora, nausea and vomiting at times. In a very similar fashion, this condition responds spectacularly to the intravenous introduction of histamine as described above. The result is relief from the headache, throbbing, nausea and vomiting. Application of cold water will relieve the patient to some extent. Throbbing is much worse when the part is allowed to hang down or after alcohols are imbibed. The pain is sometimes relieved by extension or holding up the parts so as to drain the vascular bed. After subsidence of an attack histamine is given daily in 0.1 cc. dose subcutaneously for a week, and then biweekly is usually enough to protect against attacks.

Meniere's syndrome at times seems to be of a similar vascular origin and also responds promptly to the intravenous injection of histamine diphosphate, diluted up 250 times in normal saline solution. It must be given intravenously very slowly. The rate of injection should not be more than 2 cc. to 2.5 cc. per minute. The blood pressure should be watched throughout because in hypertension patients there may be a very sudden, sharp drops to dangerously low levels of blood pressure during the intravenous injection of histamine. These vascular reactions then seem to be more of symptoms rather than entities and may possibly be the result of depression in the central nervous system and vasomotor centers or in the peripheral nerves, particularly the vasomotor dilators.

Acrodynia—Acrodynia is a somewhat similar paroxysmal disorder of the peripheral vascular bed. It occurs in infants. In this condition the flushing begins in the tips of the fingers and the toes and the nose. The babe assumes the jack-knife position, rubbing the face into the pillow and crying until the paroxysm is relieved. Histamine will bring relief and repeated doses in increasing and then maintenance doses in 0.1 mg. or 0.1 cc. will often prevent recurrences just as it does in erythrocephalagia. Furthermore, it has been shown that in babes with this disorder, injections of relatively large doses, 5,000 to 7,500 and 10,000 international units of vitamin B, thiamine chloride, will relieve the condition. Nicotinic acid or amide in 50 to 100 mg. doses has been effective in this neurovascular disorder.

Summary

A conception of the psychoneurocardiovascular disorders as seen through the eyes of an internist who is particularly interested in cardiovascular diseases has been presented.

A tentative outline of central cardiac neuroses of various types and peripheral vascular neuroses of various types has been drafted with the hope that it will receive the attention of the neuropsychiatrists and be augmented by contributions from their clinics.

University of Texas School of Medicine

Book Review

PHYSICAL DIAGNOSIS by Richard C. Cabot and F. Dennette Adams. Twelfth Edition, 1938. The Williams and Wilkins Co. 846 pages. Price $5.00.

In the present, its twelfth edition, this book, despite the new preface, still shows some of that regard for the personal equation which has been such a conspicuous characteristic of preceding editions and which makes biographical with, incidentally, bibliographical notes an appropriate element in any review of the book.

The book, now in its fifteenth printing,

first appeared in 1900 under the title, "Physical Diagnosis of Disease of the Chest." It was then a volume of 310 pages (today it has 846 pages) and its author was a young man of 32 who had graduated from the Harvard Medical School only eight years before. On the title page of this first edition he was described as Physician to Out-Patients, Massachusetts General Hospital, and Assistant in Clinical Medicine, Harvard Medical School.

The then youthful Dr. Cabot's preface to this precocious volume opens with a paragraph so amusingly characteristic of its author and so interesting from the viewpoint of recent medical history as to warrant its quotation at length:

"This book is intended for students and, so far as I am aware, contains nothing original. I have written it because I have not been able to find any small work upon the subject which does not contain glaring errors. The correct books are too large; the small books are out of date and repeat such well-worn myths as that the aortic second sound is normally louder than the pulmonic second, that aortic regurgitant murmurs are usually best heard in the second right interspace, that a hypertrophied left auricle can produce dullness and pulsation near the left sternal border, that systolic retraction at the cardiac apex means adherent pericardium, that epigastric pulsation denotes hypertrophy of the right ventricle, etc. . . . To record the well-known but often forgotten truth on such matters as these has seemed to me of importance in small books as well as in encyclopaedic treatises."

In 1905, a third edition of the volume appeared under the new title, "Physical Diagnosis," which it retains to the present day. The change in title bespoke a corresponding change in content: the old volume had dealt exclusively with the thorax and its contents; the new volume dealt no longer exclusively with a trunkated torso but with "the body as a whole," to quote a present chapter-heading. The present edition has two prefaces, the first of which is quoted as preface to the first edition though actually it originally appeared as preface to the third edition, of 1905, superceding the real first edition preface from which a paragraph has already been quoted. Growth has continued, and in this twelfth edition "the body as a whole" first acquires, in the form of some pages on psychiatry, the traces of a mind.

Through successive editions the volume has increased to its present size, always under Dr. Cabot's sole authorship until the present edition. In preparing the present edition Dr. Cabot has relied on the collaboration of Dr. F. Dennette Adams, who is described on the title page as Instructor in Medicine in the Harvard Medical School, courses for graduates, and Associate Physician at the Massachusetts General Hospital. This edition first appeared in 1939. On May 7, 1939, a month after its second printing, Dr. Cabot died, in his 71st year. Dr. Adams, who graduated from Dr. Cabot's own medical school in 1917, is now a man of 48 and should live to see the book through many more editions.

Of the problems presented by the present edition, which is more than twice the size of the original work, the authors themselves give the best account in the first sentence of the new preface:

"The progress made in physical diagnosis in the years during which the previous editions of this book have appeared has made necessary a departure from the basis on which the text was originally written. That basis was described in the preface of the first edition by the phrase 'the personal equation,' meaning that a book of this type should represent the writer's personal experience and nothing else. The selection of new material for this edition is based on the opposite principle. It seems to us today that no one's experience, no matter how varied or extensive, is sufficient to include all that the student or physical diagnosis should know. Therefore, the material in the following pages . . . reflects, but is not restricted to, our personal views. We have drawn also on the experience of many of our colleagues at the Massachusetts General Hospital. . . . This edition represents, as far as possible, a cross-section of the views on diagnosis held by the staff of the Massachusetts General Hospital."

In this sentence, as contrasted with the opening sentence of the first edition, the student is mentioned only incidentally. This fact corresponds with a division of opinion among men who are teaching physical diagnosis to second year medical students: by some of these teachers, though not by all, the present

(Continued to Page 30)

Keep Abreast of the Modern Advances In Other Fields of Medicine

Compact, practical journals, designed and edited for the busy physician . . . Helpful articles for your everyday practice.

For sample copies of these interesting journals, just clip the coupon and mail today . . . Better still, enter a subscription on the handy coupon . . . Send no money, but mail today . . . The price is only **$2.50** for 12 informative monthly issues.

DISEASES OF THE CHEST

Organ, American College of Chest Physicians

RALPH C. MATSON, M.D., Associate Clinical Professor Medicine and Surgery, University of Oregon Medical School, Portland, Oregon; **Editor.**

EDITORIAL BOARD

FRANK WALTON BURGE, M.D. ... Philadelphia, Pa.
CHAS. M. HENDRICKS, M.D. ... El Paso, Texas
CHAMP H. HOLMES, M.D. ... Atlanta, Georgia

ASSOCIATE EDITORS

RICHARD DAVISON, M.D. ... Chicago, Illinois
EDWARD P. EGLEE, M.D. ... New York, New York
G. B. GILBERT, M.D. ... Colorado Springs, Colo.
BENJAMIN GOLDBERG, M.D. ... Chicago, Illinois
CHEVALIER L. JACKSON, M.D. ... Philadelphia, Pa.
LOUIS MARK, M.D. ... Columbus, Ohio
EDGAR MAYER, M.D. ... New York, New York
JAY A. MYERS, M.D. ... Minneapolis, Minn.
RICHARD H. OVERHOLT, M.D. ... Boston, Mass.
LT. COL. WM. C. POLLOCK, M.D. ... Denver, Colo.
F. M. POTTENGER, M.D. ... Monrovia, Calif.
PAUL H. RINGER, M.D. ... Asheville, N. C.
H. I. SPECTOR, M.D. ... St. Louis, Missouri
JOHN W. STACEY, M.D. ... Tucson, Arizona
HARRY C. WARREN, M.D. ... San Francisco, Calif.

DISEASES OF THE EYE, EAR, NOSE AND THROAT

FRANCIS L. LEDERER, M.D., Professor of Otolaryngology, University of Illinois, College of Medicine, Chicago, Illinois; **Editor, Section, Otolaryngology.**

SAM'L. JAMES MEYER, M.D., Chief of Staff, Eye Department, Michael Reese Hospital, Chicago, Illinois; **Editor, Section, Ophthalmology.**

ASSOCIATE EDITORS

OTOLARYNGOLOGY

BEN L. BRYANT, M.D. ... Los Angeles, California
T. E. CARMODY, M.D. ... Denver, Colorado
A. R. HOLLENDER, M.D. ... Miami Beach, Florida
KARL M. HOUSER, M.D. ... Philadelphia, Pa.
JOHN DEVEREUX, M.D. ... New York, New York
F. E. LEJEUNE, M.D. ... New Orleans, Louisiana
WELLWOOD M. NESBIT, M.D. ... Madison, Wisconsin
HORACE NEWHART, M.D. ... Minneapolis, Minnesota
FORREST J. PINKERTON, M.D. ... Honolulu, Hawaii
F. C. SCHREIBER, M.D. ... Washington, D. C.

OPHTHALMOLOGY

BENNETT YOUNG ALVIS, M.D. ... St. Louis, Missouri
CHAS. A. BAHN, M.D. ... New Orleans, Louisiana
MILTON L. BERLINER, M.D. ... New York, New York
ALBERT L. BROWN, M.D. ... Cincinnati, Ohio
FRANK E. BURCH, M.D. ... St. Paul, Minnesota
VIRGIL G. CASTEN, M.D. ... Boston, Massachusetts
WARREN D. HORNER, M.D. ... San Francisco, Calif.
BENJ. RONES, M.D. ... Washington, D. C.
C. W. RUTHERFORD, M.D. ... Indianapolis, Indiana
EDMUND B. SPAETH, M.D. ... Philadelphia, Pa.

CLIP THIS COUPON
SEND NO MONEY

PHYSICIANS POSTGRADUATE PRESS
500 North Dearborn Street, Chicago, Illinois

Circulation Dept.
NS1-42

JOURNAL	SAMPLE COPY (No Charge)	ENTER SUBSCRIPTION
DISEASES OF THE CHEST	☐	☐ $2.50 yr.
DISEASES OF THE EYE, EAR, NOSE AND THROAT	☐	☐ $2.50 yr.

I will pay the amount of $_____ upon receipt of invoice.

Name _____

Address _____

City _____ State _____

text is thought to be too compendious for such teaching purposes. The book has grown up with its author and today retains only its undoubted value as a source of reference and orientation for the man in active practice.

The chapter on the nervous system is 62 pages in length. The three main headings of this chapter are: the "Neurologic History," "Neurologic Examination," and "Disease of the Nervous System." The treatment of the neuroses is restricted to a page and a half. Five diagnostic groups are there recognized: anxiety, neurosis, hysteria, neurosis with phobia, compulsion neurosis, and hypochondriasis. This incomplete but excellent condensation of the subject is supplemented by the very fine account of the mental status. To "the common psychoses — toxic psychosis, schizophrenia, manic depressive psychosis, and agitated depression—" the authors devote a single paragraph of four lines. But again the presentation has real value for purpose of orientation.

The writing throughout is purely descriptive and enumerative, but it is literate and lucid. As an example of lucidity, one may quote their statement that "the plantar reflex is abnormal when instead of plantar flexion there is dorsiflexion of the large toe (Babinski's sign)." Their evidence here of the familiar ambiguities of "flexion" and "extension" is typical of the whole presentation.

This chapter on the nervous system is supplemented by references in the chapter to other parts of the book. Optic atrophy, for instance, is discussed in Chapter IV.

Strongly to stress the book's limitations or defects would be merely carping criticism. The limitations are such as follow logically from the book's history and aims. A few errors have been reported in the section on cardiac murmurs, but one can be sure that these will be corrected in future editions. The statement on Page 777 that in syringomyelia "the cavity in the cord usually radiates from the central canal" is certainly misleading and, if it means what it seems to mean, is wrong. This reviewer has found no other error in the chapter on the nervous system. The book is primarily a text on physical diagnosis and hence the scanting of the psychiatric data. The data as given provide, however, a good diagnostic orientation, though not diagnostically adequate, and constitute a valuable indication of what is good usage in a well-known institution. Historically, the book began as a text on physical diagnosis of diseases of the chest and this beginning is reflected in the relative space given to this field in the present edition—21 or 22 out of the book's 36 chapters. Of pneumonia and rheumatic heart disease, for example, each has a chapter to itself; while, in the single chapter devoted to all of them, "only the more important diseases of the nervous system are discussed." The electrocardiogram is given a whole chapter, while the electroencephalogram does not seem even to be mentioned. The descriptive and enumerative presentation precludes consideration of physiological and anatomical rationale, so important in neuropathology.

But these considerations do not lessen the value of the book as a sort of over-brain for the individual practitioner of today, whose experience, no matter how varied or extensive, cannot be sufficient to include all that the student of physical diagnosis should know to speak in words that are adapted from the present preface.

Merrill Moore, M.D.
Boston, Massachusetts

SAINT JOSEPH SANITARIUM
(*Supervision of Sisters of Mercy*)
P. O. Box 236
Dubuque, Iowa
or phone 526 for information
Mild Mental and Nervous Cases
also
Rheumatism, High Blood Pressure, Neuritis, Obesity, and all Types of Convalescents
Modern Hydrotherapy, Baths and Massage
Insulin Therapy Resident Psychiatrist

WADSWORTH SANITARIUM
"WOODSCOURT"
SOUTH NORWALK, CONNECTICUT

(One hour from New York City by Merritt Park Way, or by rail)

A QUALIFIED HOME-LIKE INSTITUTION (FOR 25 GUESTS IN PRIVATE ROOMS) IN AN ATMOSPHERE WHICH IS CHEERFUL, WHOLESOME, AND CONDUCIVE TO BOTH MENTAL AND PHYSICAL WELL BEING. PROVIDING COMPETENT MEDICAL AND NURSING CARE FOR ALL TYPES OF CONVALESCENTS AND THOSE SUFFERING FROM NERVOUS DISORDERS.

For detailed Information Write:
"WOODSCOURT"
South Norwalk, Connecticut.

HARRY G. HOUZE, M.D.
Physician In Charge.

THE
RING SANATORIUM AND HOSPITAL
Arlington Massachusetts

Eight miles from Boston at an elevation of 400 feet

63rd Year

Specializing in the individualized care of Neuropsychiatric illnesses and Habit conditions. All accepted Therapies under the direction of a resident medical staff and trained assistants. Cottage plan permits a variety of accomodations.

CURTIS T. PROUT, M.D., F.A.C.P.
Medical Director

HALLAM T. RING
Administrator

In conjunction: The Ring School of Psychiatric Nursing

---

50 Beds # THE RETREAT, Inc. **Est. 1905**
DES MOINES, IOWA

For the diagnosis and treatment of Nervous and Mental Disorders in a homelike environment.

RUSSELL C. DOOLITTLE, M.D., *Medical Director*
RICHARD S. AHRENS, M.D.
HOWARD V. TURNER, M.D.
SYDNEY L. MACMULLEN, *Business Manager*

Member Central Neuro-Psychiatric Hospital Association

GLENSIDE
JAMAICA PLAIN, BOSTON, MASS.

• A small, attractively located sanitarium for nervous, mild mental or chronic illnesses. •

MABEL D. ORDWAY, M.D.
6 Parley Vale Tel. Jamaica 0044

TWIN PINES
BELMONT CALIFORNIA

Devoted to the Individualized Care of Selected Mental Cases

Homelike surroundings in small individual cottages distributed over twenty-four acres of wooded park with ample recreational facilities.

WILL REBEC, M. D., *Medical Director*

HIGHLAND HOSPITAL, Inc.

Affiliated with the Psychiatric Department of Duke University. For the modern treatment of mental and nervous, and habit disorders.

Robt. S. Carroll, M.D., Medical Director
Asheville, North Carolina

Neurological Hospital

THE ROBINSON CLINIC

Twenty-Seventh and the Paseo

KANSAS CITY, MISSOURI

G. Wilse Robinson, M.D. G. Wilse Robinson, Jr., M.D.

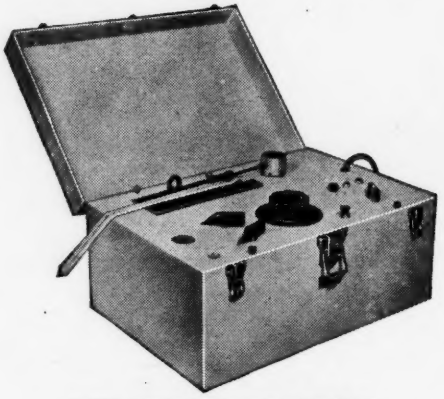
COSTEFF SANITARIUM

MENTAL AND NERVOUS DISORDERS
ALCOHOLISM AND DRUG ADDICTION
SHOCK TREATMENT (INSULIN, METRAZOL)
FEVER THERAPY

LICENSED BY STATE OF ILLINOIS
MODERATE RATES
HARRY COSTEFF, M.D., Medical Director
1109 N. Madison Avenue—Peoria, Illinois

SUBSCRIBE TO
DISEASES OF THE NERVOUS SYSTEM
—$2.50 Annually—

The
ELECTRO-MEDICAL LABORATORY
Incorporated
HOLLISTON, MASSACHUSETTS
U. S. A.



THE JUNIOR GARCEAU ELECTROENCEPHALOGRAPH

A simplified, inexpensive instrument for recording electrical potentials of the brain.

Also available in multiple types with 2 to 20 recording channels.

Write for literature.

GENERAL INFORMATION

ORIGINAL ARTICLES are published only with the understanding that they are contributed exclusively to this Journal. Manuscripts offered for publication, correspondence relating to the editorial management and books for review should be sent to The Editor, DISEASES OF THE NERVOUS SYSTEM, University of Texas School of Medicine, Galveston, Texas. DISEASES OF THE NERVOUS SYSTEM does not hold itself responsible for any statements made or opinions expressed by any contributor in any article published in its columns. All manuscripts are subject to editorial modification.

ILLUSTRATIONS will be supplied free of cost up to a certain number, but special arrangements must be made with the editor and publishers for excess illustrations and elaborate tables.

REPRINTS are furnished on order only and should be ordered of the publishers when galley proofs are submitted. Prices will be quoted at that time.

COPYRIGHT covers publication in DISEASES OF THE NERVOUS SYSTEM and articles must not be reproduced without permission of the publishers.

BUSINESS CORRESPONDENCE regarding subscriptions, advertisements, and other business of DISEASES OF THE NERVOUS SYSTEM should be addressed to the publishers, Physicians Postgraduate Press, 500 North Dearborn Street, Chicago, Illinois.

CHANGE OF ADDRESS NOTICES should include the old as well as the new address.

PREPARATION OF MANUSCRIPTS

MANUSCRIPTS should be typewritten, double spaced, with good margins, on one side of the paper only. Original copy (not a carbon) should be sent to the editor. The author should keep a carbon copy. The sheets should be numbered and the name of the author should appear on each one.

DRAWINGS AND CHARTS for reproduction should be made in black ink (NEVER in blue). Photographic prints of plates or slides on glossy paper produce the best half-tones. On the back of each photograph or drawing intended for illustration should be written in pencil its number, the author's name, and an abbreviated title of the article; also indicate "top" of picture.

LEGENDS FOR ILLUSTRATIONS should be typewritten at the end of the manuscript, in a single list, with number corresponding to those on the photographs and drawings.

BIBLIOGRAPHIES, when carefully prepared, will save much time and correspondence. Each reference in bibliography should include the following information in the order indicated: Name of the author with initials; title of the article; name of the periodical; volume, page and year. It is requested that authors use the following as a model:

1 Ebaugh, F. G.: "The Electroencephalogram," Am. J. M. Sc., 196: 882, 1938.

The month should be given if the reference is made to an issue of the current year. References should be at the end of the manuscript rather than in footnotes and arranged alphabetically.

FULL ADDRESS of the author should always be placed somewhere on his manuscript.